

In the Claims:

Claims 2, 10, 16, 18, and 20-25 are currently amended. Please cancel claims 26-44, 46, 48, and 52 without prejudice. Please add new claims 53-61. Support for amended claims 2, 10, 16, 18, and 20-25 and new claims 53-61 may be found in the original claims and specification as filed. The following list of claims will replace all prior versions, and listings, of claims in the application:

List of Claims:

1. (Original) A polymeric composition having antimicrobial properties, the polymeric composition comprising: a crosslinked chemical combination of (i) a polymer having side chains along a backbone forming the polymer, at least two of the side chains containing an amino group, (ii) an antimicrobial agent selected from metals, metal alloys, metal salts, metal complexes and mixtures thereof, and (iii) a crosslinking agent containing at least two functional groups capable of reacting with the amino groups.

2. (Currently Amended) The polymeric composition of claim 1 wherein: the polymer is a polyamide, and the polymer is synthesized by (i) reacting a monomer selected from unsaturated carboxylic acids, esters of unsaturated carboxylic acids, anhydrides of unsaturated carboxylic acids, and mixtures thereof, and a first amine to form an intermediate reaction product, wherein the first amine is selected from RR_1NH , RNH_2 , $RR_1NH_2^+$, RNH_3^+ and mixtures thereof, wherein R and R_1 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, ~~and~~ phosphorus-and, or combinations thereof, and (ii) reacting the intermediate reaction product and a second amine to form the polyamide, wherein the second amine is selected from R_2R_3NH , R_2NH_2 , $R_2R_3NH_2^+$, $R_2NH_3^+$ and mixtures thereof, wherein R_2 and R_3 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, ~~and~~ phosphorus-and, or combinations thereof, wherein multiple of the R, R_1 , R_2 , and R_3 are in vertically aligned spaced relationship along a backbone formed by the polyamide.

3. (Original) The polymeric composition of claim 2 wherein R and R₁ are alkyl.
4. (Original) The polymeric composition of claim 3 wherein the first amine is tetradecylamine.
5. (Original) The polymeric composition of claim 2 wherein the second amine is a polyalkylene polyamine.
6. (Original) The polymeric composition of claim 5 wherein the polyalkylene polyamine is pentaethylenehexamine.
7. (Original) The polymeric composition of claim 2 wherein the monomer is selected from unsaturated dicarboxylic acids, esters of unsaturated dicarboxylic acids, anhydrides of unsaturated dicarboxylic acids, and mixtures thereof.
8. (Original) The polymeric composition of claim 7 wherein the monomer is selected from maleic anhydride, maleic acid esters, and mixtures thereof.
9. (Original) The polymeric composition of claim 2 wherein the antimicrobial agent is selected from chelated silver ions, silver metal, chelated copper ions, copper metal, chelated zinc ions, zinc metal and mixtures thereof.

10. (Currently Amended) The polymeric composition of claim 1 wherein: the polymer is a polyamide, and the polymer is synthesized by (i) reacting an α,β -unsaturated lactone and a first amine to form an intermediate reaction product, wherein the first amine is selected from RR_1NH , RNH_2 , $RR_1NH_2^+$, RNH_3^+ and mixtures thereof, wherein R and R_1 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, ~~and~~ phosphorus~~and~~, or combinations thereof, and (ii) reacting the intermediate reaction product and a second amine to form the polyamide, wherein the second amine is selected from R_2R_3NH , R_2NH_2 , $R_2R_3NH_2^+$, $R_2NH_3^+$ and mixtures thereof, wherein R_2 and R_3 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, ~~and~~ phosphorus~~and~~, or combinations thereof, wherein multiple of the R, R_1 , R_2 , and R_3 are in vertically aligned spaced relationship along a backbone formed by the polyamide.

11. (Original) The polymeric composition of claim 10 wherein R and R_1 are alkyl.

12. (Original) The polymeric composition of claim 11 wherein the first amine is tetradecylamine.

13. (Original) The polymeric composition of claim 10 wherein the second amine is a polyalkylene polyamine.

14. (Original) The polymeric composition of claim 13 wherein the polyalkylene polyamine is pentaethylenehexamine.

15. (Original) The polymeric composition of claim 10 wherein the lactone is 2(5H)-furanone.

16. (Currently Amended) The ~~process~~ polymeric composition of claim 10 wherein the antimicrobial agent is selected from chelated silver ions, silver metal, chelated copper ions, copper metal, chelated zinc ions, zinc metal and mixtures thereof.

17. (Original) The polymeric composition of claim 1 wherein the crosslinking agent is selected from the group consisting of phosphines having the general formula $(A)_3P$, wherein A is hydroxyalkyl, and mixtures thereof.

18. (Currently Amended) The polymeric composition of claim 17 wherein the crosslinking agent is tris(hydroxymethyl)phosphine or tetrakis(hydroxymethyl)phosphine.

19. (Original) The polymeric composition of claim 1 wherein the antimicrobial agent is selected from chelated silver ions, silver metal, chelated copper ions, copper metal, chelated zinc ions, zinc metal and mixtures thereof.

20. (Currently Amended) A The polymeric composition of claim 1, further comprising having antimicrobial properties, the polymeric composition comprising: ~~(a) a first crosslinked chemical combination of (i) a first polymer having side chains along a backbone forming the first polymer, at least two of the side chains containing an amino group, (ii) a first antimicrobial agent selected from metals, metal alloys, metal salts, metal complexes and mixtures thereof, and (iii) a first crosslinking agent containing at least two functional groups capable of reacting with the amino groups; and (b) a second crosslinked chemical combination of (i) a second polymer having side chains along a backbone forming the second polymer, at least two of the side chains containing an amino group, (ii) a second antimicrobial agent selected from metals, metal alloys, metal salts, metal complexes and mixtures thereof, and (iii) a second crosslinking agent containing at least two functional groups capable of reacting with the amino groups, wherein the first antimicrobial agent and the second antimicrobial agent are different.~~

21. (Currently Amended) The polymeric composition of claim 20 wherein: the first polymer and the second polymer are a polyamide, and the polyamide is synthesized by ~~(i) reacting a monomer selected from unsaturated carboxylic acids, esters of unsaturated carboxylic acids, anhydrides of unsaturated carboxylic acids, and mixtures thereof, and a first an amine to form an intermediate reaction product, wherein the first amine is selected from RR_1NH , RNH_2 , $RR_1NH_2^+$, RNH_3^+ and mixtures thereof, wherein R and R_1 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, and phosphorus and combinations thereof, and (ii) reacting the intermediate reaction product and a second amine to form the polyamide, wherein the second amine is selected from R_2R_3NH , R_2NH_2 , $R_2R_3NH_2^+$, $R_2NH_3^+$ and mixtures thereof, wherein R_2 and R_3 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, and phosphorus and combinations thereof, wherein multiple of the R , R_1 , R_2 , and R_3 are in vertically aligned spaced relationship along a backbone formed by the polyamide.~~

22. (Currently Amended) The polymeric composition of claim ~~24~~ 20 wherein: the ~~first~~ crosslinking agent and the second crosslinking agent are selected from the group consisting of phosphines having the general formula $(A)_3P$, wherein A is hydroxyalkyl, and mixtures thereof.

23. (Currently Amended) The polymeric composition of claim 20 wherein: the ~~first~~ antimicrobial agent is selected from chelated copper ions, copper metal, and mixtures thereof, and the second antimicrobial is selected from chelated silver ions, silver metal, and mixtures thereof.

24. (Currently Amended) The polymeric composition of claim 20 wherein: the ~~first~~ antimicrobial agent is selected from chelated copper ions, copper metal, and mixtures thereof, and the second antimicrobial is selected from chelated zinc ions, zinc metal, and mixtures thereof.

25. (Currently Amended) The polymeric composition of claim 20 wherein: the ~~first~~ polymer and the second polymer are a polyamide, and the polyamide is synthesized by (i) reacting an α,β -unsaturated lactone and ~~a first an amine to form an intermediate reaction product~~, wherein the first amine is selected from RR_1NH , RNH_2 , $RR_1NH_2^+$, RNH_3^+ and mixtures thereof, wherein R and R_1 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, and phosphorus and combinations thereof, and (ii) ~~reacting the intermediate reaction product and a second amine to form the polyamide, wherein the second amine is selected from R_2R_3NH , R_2NH_2 , $R_2R_3NH_2^+$, $R_2NH_3^+$ and mixtures thereof, wherein R_2 and R_3 can be the same or different and each contain between about 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, and phosphorus and combinations thereof, wherein multiple of the R, R_1 , R_2 , and R_3 are in vertically aligned spaced relationship along a backbone formed by the polyamide.~~

26.-44. (Canceled)

45. (Previously Presented) A polyamide material comprising:

(A) a crosslinked polymeric material formed by a process comprising:

(i) reacting a reaction mixture comprising a monomer selected from maleic anhydride, maleic acid esters, and mixtures thereof, and an amine having the formula $R-NH_2$ to form an intermediate reaction product, wherein R contains between 1 and 50 carbon atoms and is optionally substituted with heteroatoms oxygen, nitrogen, sulfur, phosphorus, and combinations thereof; wherein at least a portion of the R groups are substituted with an amino group; and

(ii) reacting the intermediate reaction product and the amine to form a polyamide; and

(iii) reacting the polyamide with a crosslinking agent to form a crosslinked polymer, wherein the crosslinking agent includes at least two functional groups capable of reacting with amino groups; and

(B) copper ions, copper metal, or a mixture thereof.

46. (Canceled)

47. (Previously Presented) A polyamide material comprising:

(A) a polymer formed by a process comprising:

(i) reacting a reaction mixture comprising a monomer selected from unsaturated carboxylic acids, esters of unsaturated carboxylic acids, anhydrides of unsaturated carboxylic acids, and mixtures thereof, and an amine having the formula $R-NH_2$ to form an intermediate reaction product, wherein at least a portion of the R groups are substituted with an amino group; and

(ii) reacting the intermediate reaction product and the amine to form a polyamide; and

(B) an antimicrobial agent selected from a metal, a metal alloy, a metal salt, a metal complex, or mixtures thereof.

48. (Canceled)

49. (Previously Presented) A polyamide material comprising:

(A) a crosslinked polymeric material formed by a process comprising:

(i) reacting a reaction mixture comprising a monomer selected from unsaturated carboxylic acids, esters of unsaturated carboxylic acids, anhydrides of unsaturated carboxylic acids, and mixtures thereof, and an amine having the formula $R-NH_2$ to form an intermediate reaction product, wherein R is substituted with at least one amino group; and

(ii) reacting the intermediate reaction product and the amine to form a polyamide; and

(iii) reacting the polyamide with a crosslinking agent to form a crosslinked polymer, wherein the crosslinking agent includes at least two functional groups capable of reacting with amino groups; and

(B) an antimicrobial agent selected from a metal, a metal alloy, a metal salt, a metal complex, or mixtures thereof.

50. (Previously Presented) The polyamide material of claim 49 wherein the monomer comprises maleic anhydride, maleic acid esters, or mixtures thereof.

51. (Previously Presented) The polyamide material of claim 49 wherein the antimicrobial agent includes chelated silver ions, silver metal, chelated copper ions, copper metal, chelated zinc ions, zinc metal, or mixtures thereof.

52. (Canceled)

53. (New) A crosslinked polymeric material formed from:

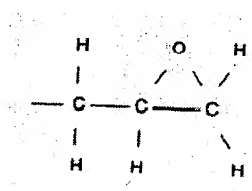
(A) a polyamide formed from a mixture which comprises:

(i) one or more monomers selected from maleic anhydride, maleic acid esters, and mixtures thereof; and

(ii) one or more amines selected from RNH_2 , a polyalkylene polyamine, and mixtures thereof, wherein RNH_2 and the polyalkylene polyamine each contain between 1 and 50 carbon atoms and are optionally substituted with heteroatoms oxygen, nitrogen, sulfur, phosphorus, or combinations thereof;

(B) one or more antimicrobial agents selected from metals, metal alloys, metal salts, metal complexes and mixtures thereof

(C) one or more crosslinking agents selected from aliphatic isocyanate compounds having 2 or more $-\text{N}=\text{C}=\text{O}$ groups; aromatic isocyanate compounds having 2 or more $-\text{N}=\text{C}=\text{O}$ groups; aliphatic aldehyde compounds having 2 or more $-\text{CHO}$ groups; aromatic aldehyde compounds having 2 or more $-\text{CHO}$ groups; phosphines having the general formula $(\text{A})_2\text{P}(\text{B})$ wherein A is hydroxyalkyl, and B is hydroxyalkyl, alkyl, or aryl; epoxy resins having end groups of the formula:



, and mixtures thereof.

54. (New) The crosslinked polymeric material of claim 53, wherein the monomer comprises maleic anhydride mono-ethyl ether.

55. (New) The crosslinked polymeric material of claim 53, wherein one or more amines comprise tetradecylamine.

56. (New) The crosslinked polymeric material of claim 53, wherein one or more amines comprise pentaethylenehexamine.

57. (New) The crosslinked polymeric material of claim 53, wherein one or more antimicrobial agents comprise chelated silver ions, silver metal, or a mixture thereof.

58. (New) The crosslinked polymeric material of claim 53, wherein one or more antimicrobial agents comprise chelated copper ions, copper metal, or a mixture thereof.

59. (New) The crosslinked polyamide material of claim 53, wherein one or more crosslinking agents comprise glutaraldehyde.

60. (New) The crosslinked polymeric material of claim 53, wherein one or more crosslinking agents comprise tetrakis(hydroxymethyl)phosphine.

61. (New) The crosslinked polymeric material of claim 53, wherein one or more crosslinking agents comprise tris(hydroxymethyl)phosphine.